(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 340 898 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
04.09.1996 Bulletin 1996/36

(51) Int Cl.[6]: **G06K 19/08**

(21) Application number: **89302540.3**

(22) Date of filing: **15.03.1989**

(54) Security coding

Sicherheitskodierung

Codage de sécurité

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(30) Priority: **05.04.1988 GB 8807937**
17.10.1988 GB 8824293

(43) Date of publication of application:
08.11.1989 Bulletin 1989/45

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(56) References cited:
WO-A-85/02927
FR-A- 1 510 531
GB-A- 2 090 194
GB-A- 2 173 914

- **RESEARCH DISCLOSURE, no. 160, August 1977, page 80, Havant, GB; "Printed documents and the detection of markings thereupon"**

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Printed by Jouve, 75001 PARIS (FR)

Description

This specification describes an invention relating to security coding.

FR-A-1 510 531 discloses a substrate carrying a coded ink symbol containing a component having characteristic sharp absorption bands in the infra-red. WO-A-85/02927 discloses a credit card carrying an infra-red code masked by an infra-red invisible, optically opaque mask, such as an electromagnetic recording strip.

According to the present invention there is provided a method of security coding an article which comprises applying to the article a first identification mark comprising at least one colourless or weakly coloured material having a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm and overprinting the first identification mark with a second identification mark comprising a colorant which does not have a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm.

The colourless or weakly coloured material having a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm is hereinafter refered to as the "i-r absorber", the first identification mark is hereinafter referred to as the "i-r mark", the second identification mark is hereinafter referred to as the "colour mark" and the combination of first and second identification marks is hereinafter referred to as the "combined mark".

The i-r mark may be formed simply by applying the i-r absorber to the surface of the article, preferably as an ink which dries to leave a printed image containing the i-r absorber. The image can be in any shape, irregular or regular (e.g. a square or triangle), which will give a response when scanned by an i-r scanner/detector, such as a laser scanner and diode detector. The i-r mark is however, preferably in the form of a bar code. The code will preferably identify the origin of the article, and/or provide other relevant information about it, when addressed by an appropriately programmed i-r bar code reader.

The i-r mark is overprinted with the colour mark having sufficient absorption in the visible region of the spectrum to render the i-r mark non-detectable by the human eye in order to form the combined mark. The visually opaque colour mark may itself comprise an image, such as a a block of colour, a logo, a pattern or a picture which is applied to the surface of the article, before or after application of the i-r mark.

The i-r mark is preferably in the form of an i-r bar code incorporating coded information which will identify the origin of the article, and/or provide other relevant information, when addressed with an appropriately programmed i-r bar code reader.

In a preferred feature of the present invention the i-r mark comprises a specific mixture of i-r absorbers having different spectral responses, so that the mixture has a unique response, providing a "fingerprint" spectral pattern and thus a unique identity for the marked article. If the i-r mark is in the form of a bar code, such a unique i-r bar code can be used in conjunction with a programmed bar-code reader to produce a response only if it detects the "fingerprint" spectral pattern associated with the specific mixture of i-r absorbers. A detector, tuned to the unique spectral response of the mixture will detect a counterfeit by the absence of a part of the spectral response, unless the counterfeit i-r mark comprises the specific mixture of i-r absorbers used in the genuine i-r mark.

It is further preferred that both the i-r mark and the colour mark are in the form of codes and such marks in the form of codes are hereinafter referred to as the "coded i-r mark" and the "coded colour mark" respectively.

The coded i-r mark is preferably printed with an ink containing an i-r absorber which has an insignificant absorption in the visible region of the spectrum so that it it is substantially invisible to the eye in normal white light.

The coded colour mark is free from any components which have a significant absorption over the range of the spectrum covered by i-r absorber in the coded i-r mark and is preferably formed by over-printing the coded i-r mark with the coded colour mark. Such overprinting is generally sufficient to hide or disguise the coded i-r mark or to render it indecipherable by visual inspection, even when the i-r absorber in the coded i-r mark is visible to the eye on account of its slight absorption in the visible region of the spectrum.

Both the coded i-r mark and the coded colour mark are preferably bar codes such as are applied to a wide variety of goods to indicate the origin, type, class, quality, etc of the article.

The colourless or weakly coloured i-r absorber used in the present invention preferably has a significant absorption in the near i-r region from 700 to 1200 nm and especially from 750 to 1000 nm. Such an i-r absorber is distinguished from conventional materials used in laser-scanned i-r absorbing bar-codes, such as carbon black, which are generally strongly coloured in addition to having a significant absorption in the i-r region of the spectrum. The i-r absorber preferably has a very low absorption in the visible region of the spectrum so that it is barely detectable by the eye when present in sufficient amount to give a strong absorption or reflectance signal in the i-r region. A preferred i-r absorber has an absorption in the visible region of the spectrum, from 400-700 nm, which is not more than 40%, and especially not more than 20%, of the absorption in the near i-r region of the spectrum, 700-1500 nm, as determined by the areas under the absorption curves in these regions of the spectrum.

Examples of i-r absorbers for use in the present invention are disclosed in an article by M.Sumitani in Kagaku Kogyo, May 1986 pages 379-89. These include nitroso compounds, cyanines, imminium and dimminium compounds, squarilium and croconium compounds,

metal dithiolenes, quinones, phthalocyanines, azos, indoanilines and donor-acceptor molecules. However, preferred compounds, because of their pale or zero coloration are (i) metal dithiolenes such as are disclosed in EP 135 995A, Research Disclosure No 21612, April 1982, USP 3,875,199GB 1,297,492 US 3,999,838, Mol Cryst, Liq Cryst Vol 56 pp 225-8, Mol Cryst, Liq Cryst Vol 41 pp 11-3, Mol Cryst, Liq Cryst 1980 56 pp 249-55 and Tetrahedron 1982 18(17) pp 2715-20, (ii) bisazo compounds having a central thiophene or thiazole component linked through an azo group to phenyl group carrying at least two electron-withdrawing groups, such as are described in EP 280434, (iii) squarilium compounds, and more especially (iv) (substituted-thio)phthalocyanines such as those disclosed in EP 155 780, EP 282181 and EP 282182.

Examples of especially preferred i-r absorbers (IRA) are the substituted phthalocyanines:

IRA1 hepta-(4-methylphenylthio)-tetra-1-amino-2-thiophenylene)-CuPc
IRA2 decasulpho-hepta-(4-methylphenylthio)-tetra-1-amino-2-thiophenylene)-CuPc
IRA3 dodecasulpho-pentadeca-(4-methylphenylthio)-CuPc
IRA4 decasulpho-penta-(2-aminophenylthio)-penta-(1-amino-2-thiophenylene)-CuPc
IRA5 1,1,3,3-tetramethylbutylammonium salts of (2) and (4)
IRA6 1,3-di(2-tolyl)guanidinium salt of (3)
IRA7 pentadeca-(4-methylphenylthio)-CuPc

The bar-coding method of the present invention is suitable for the marking of secure documentation, currency and equivalents such as cheques and credit cards and identification papers such as passports, identity cards and tickets, for the protection of copyright materials and trademarks, by incorporating infra-red bar codes into logos and copyright material, such as tapes, cassettes, books and films and labels for affixing to these, and to high valuable articles, such a spirits, perfumes, designer goods, cameras etc to inhibit counterfeiting.

The invention is further illustrated by the following examples in which all parts and percentages are by weight.

Example 1

(a) An ink was made by dissolving 1 part of IRA3, described above, in a mixture of 60 parts of water, 30 parts of diethylene glycol and 10 parts of N-methylpyrrolidone. The ink was applied to a sheet of paper in the form of a bar code using an ink-jet printer. The image on the paper was a very pale beige which was only just detectable by the eye and could not be read by a standard visible bar code reader detecting at a wavelength of 630 nm. It could, however, be read and deciphered by an i-r bar code reader detecting at 780-800 nm.

(b) The very pale beige bar code prepared in Example 1(a) was completely covered by overprinting with an ink consisting of 3 parts of CI Direct Black 168 dissolved in a mixture of 60 parts of water, 30 parts of diethylene glycol and 10 parts of N-methylpyrrolidone, also applied by ink jet printer. The i-r bar code could not be reproduced by photcopying or detected by visual inspection but could be read and deciphered with an i-r bar code reader detecting at 780-800 nm. The same result was achieved when the CI Direct Black 168 was replaced with the same amount of CI Acid Red 249 or CI Direct Yellow 86.

Example 2

The very pale beige bar code described in Example 1(a) was overprinted with a different black bar code using the black ink described in Example 2. The faint i-r bar code could not be read by eye because it was partly obscured by the black bar code. The black bar code was read and deciphered with a visible bar code reader detecting at 630 nm and the i-r bar code was read and deciphered with an i-r bar code reader detecting at 780-800 nm. However, the i-r bar code could not be read with the visible bar code reader and vice-versa. A photcopy (carbon black image) of the bar code had a similar visual appearance to the original but both the visible and i-r bar code readers read and deciphered only the image of the original black bar code. The absence of the i-r bar code from the photocopy established that it was a copy and not the original.

Claims

1. A method of security coding an article which comprises applying to the article a first identification mark comprising at least one colourless or weakly coloured material having a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm and overprinting the first identification mark with a second identification mark comprising a colorant which does not have a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm.

2. A method according to Claim 1 wherein the first identification is in the form of a bar code.

3. A method according to Claim 1 or Claim 2 wherein the first identification comprises at least two colourless or weakly coloured materials having significant absorptions in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm with

different spectral responses.

4. A method according to any one of Claims 1 to 3 wherein the first and second identification marks are both in the form of bar codes.

5. A method according to any one of Claims 1 to 4 wherein the article is a credit card, currency note, cheque, passport, identity card, label or ticket.

6. An article carrying a first identification mark comprising at least one colourless or weakly coloured material having a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm overprinted with a second identification mark comprising a colorant which does not have a significant absorption in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm.

7. An article according to Claim 6 wherein the first identification is in the form of a bar code.

8. An article according to Claim 6 or Claim 7 wherein the first identification comprises at least two colourless or weakly coloured materials having significant absorptions in the near infra-red region of the electromagnetic spectrum from 700nm to 1500nm with different spectral responses.

9. An article according to any one of Claims 6 to 8 wherein the first and second identification marks are both in the form of bar codes.

10. An article according to any one of Claims 6 to 9 in the form of a credit card, currency note, cheque, passport, identity card, label or ticket.

Patentansprüche

1. Verfahren zur Sicherheits-Codierung eines Gegenstandes, bei dem auf den Gegenstand eine erste Identifizierungsmarke aufgebracht wird, die mindestens ein farbloses oder schwachgefärbtes Material mit einer signifikanten Absorption in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm aufweist, und die erste Identifizierungsmarke mit einer zweiten Identifizierungsmarke überdruckt wird, die einen Farbstoff aufweist, der in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm keine signifikante Absorption hat.

2. Verfahren nach Anspruch 1, wobei die erste Identifizierung in Form eines Barcodes vorliegt.

3. Verfahren nach Anspruch 1 oder 2, wobei die erste Identifizierung mindestens zwei farblose oder schwachgefärbte Materialien mit signifikanten Absorptionen in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm mit unterschiedlichem spektralen Verhalten aufweist.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei sowohl die erste als auch die zweite Identifizierungsmarke in Form eines Barcodes vorliegt.

5. Verfahren nach einem der Ansprüche 1 bis 4, wobei es sich bei dem Gegenstand um eine Kreditkarte, eine Währungsnote, einen Scheck, einen Paß, eine Identitätskarte, ein Etikett oder ein Ticket handelt.

6. Gegenstand, der eine erste Identifizierungsmarke trägt, die mindestens ein farbloses oder schwachgefärbtes Material mit einer signifikanten Absorption in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm aufweist, welche mit einer zweiten Identifizierungsmarke überdruckt ist, die ein Färbemittel aufweist, das in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm keine signifikante Absorption hat.

7. Gegenstand nach Anspruch 6, wobei die erste Identifizierung in Form eines Barcodes vorliegt.

8. Gegenstand nach Anspruch 6 oder 7, wobei die erste Identifizierung mindestens zwei farblose oder schwachgefärbte Materialien mit signifikanten Absorptionen in der nahen Infrarot-Region des elektromagnetischen Spektrums von 700 nm bis 1500 nm mit unterschiedlichem spektralen Verhalten aufweist.

9. Gegenstand nach einem der Ansprüche 6 bis 8, wobei sowohl die erste als auch die zweite Identifizierungsmarke in Form eines Barcodes vorliegt.

10. Gegenstand nach einem der Ansprüche 6 bis 9 in Form einer Kreditkarte, einer Währungsnote, eines Schecks, eines Passes, einer Identitätskarte, eines Etiketts oder eines Tickets.

Revendications

1. Procédé pour le codage de sûreté d'un article, qui comprend l'application à l'article d'une première marque d'identification comprenant au moins une matière incolore ou faiblement colorée présentant une absorption importante dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm et l'impression sur la première marque d'identification d'une seconde marque d'identi-

fication comprenant un colorant qui ne présente pas d'absorption importante dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm.

2. Procédé suivant la revendication 1, dans lequel la première identification est sous forme d'un code à barres.

3. Procédé suivant la revendication 1 ou la revendication 2, dans lequel la première identification comprend au moins deux matières incolores ou faiblement colorées présentant des absorptions importantes dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm, avec des réponses spectrales différentes.

4. Procédé suivant l'une quelconque des revendications 1 à 3, dans lequel les première et seconde marques d'identification sont toutes deux sous forme de codes à barres.

5. Procédé suivant l'une quelconque des revendications 1 à 4, dans lequel l'article est une carte de crédit, un papier monnaie, un chèque, un passeport, une carte d'identité, une étiquette ou un ticket.

6. Article portant une première marque d'identification comprenant au moins une matière incolore ou faiblement colorée présentant une absorption importante dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm portant en surimpression une seconde marque d'identification comprenant un colorant qui ne présente pas d'absorption importante dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm.

7. Article suivant la revendication 6, dans lequel la première identification est sous forme d'un code barres.

8. Article suivant la revendication 6 ou 7, dans lequel la première identification comprend au moins deux matières incolores ou faiblement colorées présentant des absorptions importantes dans la région du proche infrarouge du spectre électromagnétique de 700 nm à 1500 nm, avec des réponses spectrales différentes.

9. Article suivant l'une quelconque des revendications 6 à 8, dans lequel les première et seconde marques d'identification sont toutes deux sous forme de codes à barres.

10. Article suivant l'une quelconque des revendications 6 à 9, sous forme d'une carte de crédit, d'un papier monnaie, d'un chèque, d'un passeport, d'une carte d'identité, d'une étiquette ou d'un ticket.